Feb. 28, 1933. G. J. OLNEY 1,899,632

GRAVITY OPERATING DEVICE FOR SORTING FRUITS OR VEGETABLES

Filed March 13, 1931 3 Sheets-Sheet 1

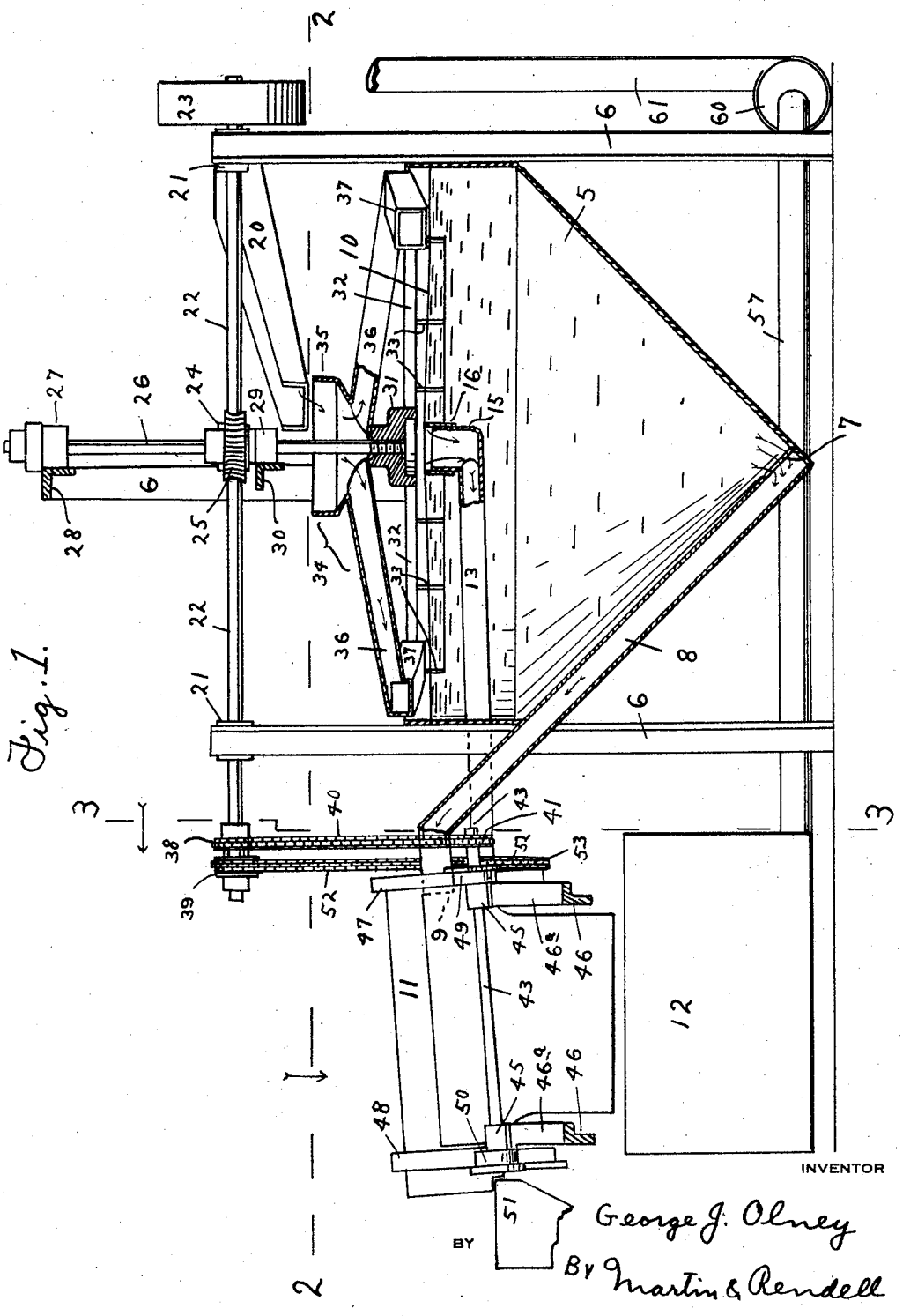


Fig. 1.

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By Martin & Rendell

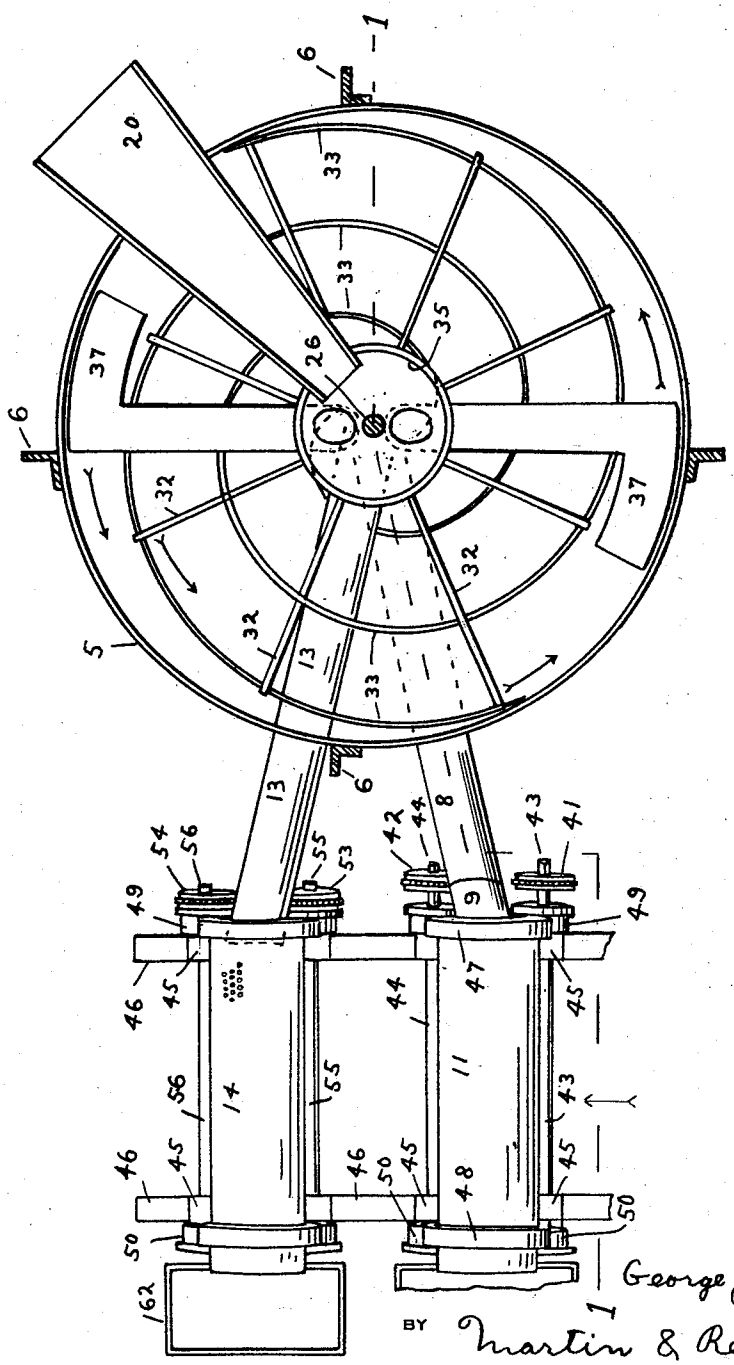
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Fig. 2.



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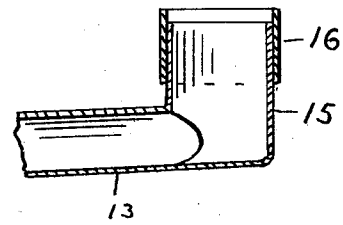


Fig. 4.

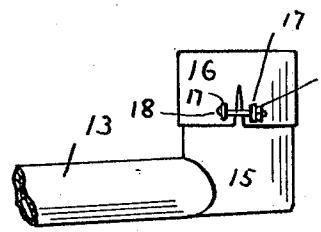
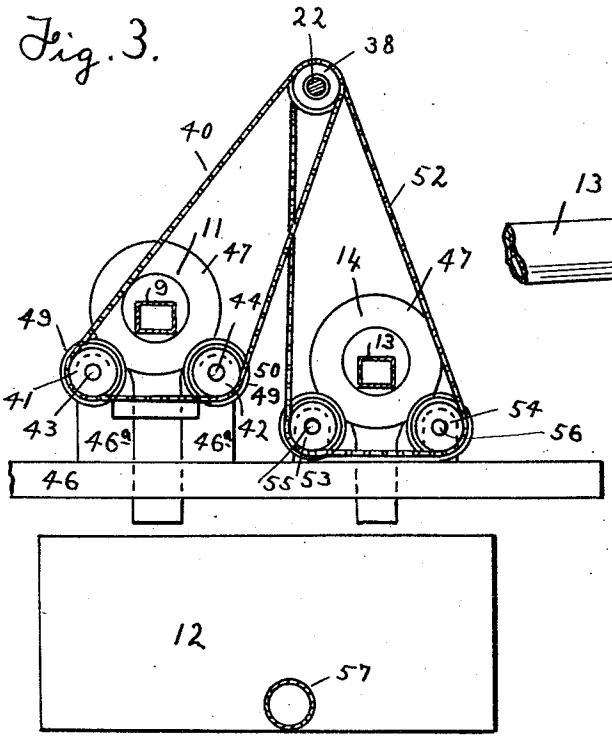


Fig. 5.

Fig. 3.



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Patented Feb. 28, 1933 1,899,632

UNITED STATES PATENT OFFICE

GEORGE J. OLNEY, OF WESTERNVILLE, NEW YORK

GRAVITY OPERATING DEVICE FOR SORTING FRUITS OR VEGETABLES

Application filed March 13, 1931. Serial No. 522,349.

This invention relates to a liquid-using and gravity-operating machine for sorting and cleaning fruit or vegetables.

The purpose of my present invention is to provide a new and improved machine of the type referred to and one which is more reliable and more free from possible errors in the sorting or separating so that much less good material is discarded with the waste material and especially so that no waste or poor material is allowed to remain with the good material.

Many machines of this type fail to get a reliable and accurate separation of the good from the waste or poorer materials; for instance good peas which are relatively heavy may stick to the lighter pea leaves or pea skins and so be carried off with the waste material; or poor peas or pea skins which are light may stick to a good heavy pea and be carried on with the good peas, thus reducing the grade of the selected peas or seriously interfering with the grading operation supposed to be carried on by the machine.

I have found from observation that these defects in separation occur at the initial stage of placing the incoming material in the separating tank and is caused at that stage by the incoming material being deposited too thickly in a limited area generally by the incoming material being continuously deposited in the same place or in a relatively small area of the surface of the water or other liquid in the tank. One of the chief purposes of my present invention is to overcome the above mentioned defects by providing a machine so constructed and arranged that the incoming material will be deposited over a continuously changing or new area of the liquid by having the discharge end or part of the chute supplying the new material move over an extended path preferably as by moving slowly in an extended circle.

A further purpose is to provide new and improved means both separately and in combination with said movable distribution feature for collecting the light or floating material from the surface of the liquid.

Other purposes are to provide convenient and effective arrangement and combination of mechanism and parts for accomplishing the above purposes.

Fig. 1 is a vertical sectional view mostly on line 1—1 of Fig. 2 of a machine embodying this invention.

Fig. 2 is a horizontal sectional view mostly on line 2—2 of Fig. 1 and showing most of the machine in a top or plan view.

Fig. 3 is a vertical sectional view on line 3—3 of Fig. 1.

Figs. 4 and 5 are respectively vertical sectional and side elevation views of the central or upper outlet from the main tank.

The separating tank 5 is circular in form, its upper part being cylindrical and its lower part being a cone tapering to be smaller at its lower and pointed end. This main separating tank is of sufficient size to hold the desired quantity of water or other liquid and to have space and area to effectively separate a large quantity of continuously incoming material. It will be understood of course that the machine is of the type where the material to be separated is continuously fed into the machine along with a good deal of liquid and where the separation goes on continuously and the separated materials are continuously being led away from the machine in separate lines, both usually with a considerable amount of liquid to form the vehicle for moving the materials. Conveniently and for economy the liquid is soon separated from both the good and the waste materials and brought back to the machine to be used over and over again.

The machine illustrated herein is especially adapted and designed for separating good peas from the other materials as poor peas, pea skins, pea leaves and other light foreign matter and its construction and operation as such a machine will be so described for the purpose of definiteness and clarity but it will be understood that such description and use is illustrative only and that my machine is adapted to a wide class of work in separating fruit, vegetables and other like material by the use of liquid and the gravity method of separation.

A further purpose is to provide a machine which can be used to grade peas or

other material by this gravity method by adjusting the gravity of the liquid so as to divide the good peas into two qualities one of which will sink and the other will float.

The tank 5 is suitably held in fixed position by upright supports 6. At the lower end of its tapered bottom the tank is provided with an aperture 7 for the heavy, that is good peas, that have sunk to the bottom of the tank, to escape through the upwardly slanting outlet pipe 8. The upper end 9 of this pipe is sufficiently below the general liquid level 10 in the tank 5 to cause a sufficient current of water to travel upward through said pipe 8 to carry upward therewith the good heavy peas that have sunk in the large quiet area of the tank 5. The outflowing stream of good peas and liquid from the upper end 9 of the pipe 8 is conducted into a suitable screen such for instance as a rotating inclined screen 11 through the perforated or slitted sides of which the water escapes to a gathering vat 12 below.

The outlet pipe 13 for the lighter or waste material extends from a separate or second rotating inclined screen 14 through the side of the tank 5 and thence a short distance below the water level 10 in the tank to the center of the tank where the said pipe is provided with a short upstanding arm or length 15 with the top of said vertical length slightly below the water level 10. Adjustably attached to the upper part of this upstanding length 15 there is provided an encircling sleeve 16 as shown in the detailed drawings, Fig. 4. This sleeve may be in the form of a split or partly split member having near the ends of its split part opposing outwardly projecting lugs 17 pierced by the shank of a headed bolt 18, the screw-threaded end of which receives a nut 19. By loosening the nut the split end springs apart sufficiently to allow the said sleeve 16 to be adjusted to the exact height required and set at that position by tightening the said nut and bolt. In this way the overflow level at the center of the tank through the upstanding arm 15 of outlet pipe 13 may be adjusted according to the speed or quantity of the incoming water and according to the level of the liquid at the upper and outlet end of pipe 9 going to the first screen 11 from pipe 8. In practice the upper edge of this adjustable sleeve is set about one inch higher than the level of the liquid in the outlet pipe 9 conveying the good peas into said first screen 11.

Some distance above the top of the tank 5 there is suitably supported a stationary feeding trough 20 conveniently in the form of an open-topped trough slanting downwardly as it extends inwardly nearly to the center of the tank. Into the outer and upper end of this stationary feeding trough is fed the incoming supply of mixed fruit or vegetables, in this case peas, with the accompanying poor peas, pea skins, leaves and other foreign matter with a sufficient supply of water to flow said materials through the machine herein described.

Near the upper ends of the upright support 6 seen at the opposite sides of the tank as viewed in Fig. 1, there are secured bearing boxes 21 in which are journaled the horizontal shaft 22 power-driven through a belt (not shown) being applied to the pulley 23 at the right end of said shaft. On this shaft 22 over the center of the tank 5 is fixed a worm wheel 24 engaging a worm gear 25 secured to a vertical shaft 26. This shaft is supported some distance above the worm wheel 24 in a bearing 27 provided on a cross brace 28, the opposite ends of which are carried by the upper ends of the other two upright supports 6 spaced approximately ninety degrees around the tank from the two supports 6 carrying the horizontal shaft 22. Below the worm wheel 24 the vertical shaft 26 is supported and steadied by a bearing 29 secured to a lower cross bar 30, the opposite ends of which are secured to the same two uprights just referred to as carrying the upper cross brace 28. It will be seen that this connection by reason of the relative small size of the worm wheel 24 and the relative large size of the worm gear 25 produces a very slow motion to the vertical shaft 26.

The shaft 26 extends almost down to the water level 10 in the tank 5 and is centered directly over the circular opening provided by the sleeve 16 and the upright part 15 of outlet pipe 13. Suitably and fixedly secured to the lower end of the vertical shaft 26 there is provided a hub-like member 31 from which radiate several horizontally arranged arms 32. To the lower sides of these arms are attached a series of collectors, preferably two, 33. Each collector is in the form of a vertically arranged strip of metal bent into a spiral form as plainly appears in Fig. 2. As seen in said figure, the outer end of one spiral is attached to the outer end of an arm 32 towards the left side of the tank and its superposed parts as seen in said figure. This spiral then extends clockwise about and over the upper portion of the tank and in a spiral direction for about one and one-half turns until its inner end reaches to and is fastened to the hub 31. The inner extremity of said collector extends as close as practicable to the upper part of the sleeve 16. The spiral as it is extended beneath successive fingers 32 has been attached to each finger so as to hold said spiral in place. The other spiral-shaped collector as will be seen in Fig. 2 begins at one of the long fingers at the right of the machine and extends gradually inwardly and spaced between the other spiral until the inner end of this second spiral has its inner end fastened to the said hub about one and

one-half turns from its starting place with the inner extremity of said collector as close as may be to the sleeve 16.

The width, that is the height of these spiral collectors is sufficient to leave a part of the collectors projecting slightly above the water level and to have the lower part of the said collectors project into the water a short distance below the water level so as to gradually and continuously but gently collect and push towards the center any material that remains floating upon the surface or very close to the surface of the liquid level in said tank.

Carried by the same hub 31 which is at the lower end of the upright shaft 26, there is provided a movable chute designated as a whole by the numeral 34 and consisting of an open-topped hopper 35 surrounding said shaft 26 and fastened to said hub 31 so that the said chute will be rotated slowly by said shaft and in unison with the fingers 32 and the two collectors 33 just described. Conveniently the said hopper 35 will be made in the form of a short cylindrical upper portion with an inverted cone-shaped lower half. From this lower slanting part of the hopper there project one or more, preferably two, oppositely disposed radially extending tubes 36 forming the central portion of the chute 34. These tubes extend out almost to the inner side of the tank 5 near its top with said tubes sloping downwardly at a decided angle. After these tubes 36 reach the respective points mentioned they are provided with a rearwardly extending portion 37 still in the form of a tube or box and still slanting downward towards the water level. As already mentioned the two spiral collectors 33 extend clockwise as they extend inwardly as seen from above, that is as seen in Fig. 2. As these radially extending tubes 36 and the hopper 35 and the tubular extensions 37, altogether forming the movable chute 34, are attached to the shaft 36 and said shaft is rotated counterclockwise, the "rearward" direction of the extensions 37 means that said extensions are to the rear of their respective tubes 36 as the said movable chute is rotated. As seen in Fig. 2 the near tube has its extension 37 directed to the left and the farther tube 36 has its extension directed to the right.

It will now be seen that the mixture of good and poor peas, pea leaves and pea skins and other waste matter deposited into the fixed chute 20 with a proper proportion of water both the materials and the water or other liquid being continuously supplied, the mixture of materials and water will flow down the fixed chute to its inner end which is within the circle of the cylindrical part 35 of the said movable chute and just above the top of said cylindrical part 35. The mixture of the materials and liquid will then flow by gravity from the hopper 35 through the two openings leading to the downwardly slanting tubes 36 which carry the mixture to the outer zone of the liquid in the tank 5. The purpose of the rearward extensions 37 is to allow the mixture of incoming water and peas or other material to be deposited gently upon the surface of the liquid in the tank and without setting up any cross currents within the tank and particularly without setting up any radially extending or centrifical currents. It will be seen in fact that the movable chute and its tubes 36 and curved extensions 37 are all adapted to effect a gentle deposit of the water or other liquid and its mixture of peas and accompanying material upon the top of the water in the tank with as little disturbance as possible and with as little fall or force given to the flowing water and material carried thereby as is compatible with a free and sufficiently rapid handling of the material. It will be seen that the lower or delivery end of the extensions 37 are very close to the water level 10 in the tank and that it may be said that these extensions are constantly being moved backward from beneath the material flowing thereon or therethrough and thus neutralize to a considerable extent the onward motion of the downwardly flowing water and materials due to the necessary flow through the inclined movable chute. It will be understood that the mixture of water and peas and other material coming down the fixed trough 20 is sufficient to keep an accumulation of such liquid and material in the hopper 35 so that the rotating chute 34 has at all times a substantially equal amount of said mixture flowing down through both of the tubes 36 and curved extensions 37.

It will be seen particularly from an inspection of Fig. 2 that the mixture of water and peas and accompanying matter deposited by the two delivery ends of the chute will be deposited over the large circular zone next to the outer edge of the tank and extending in from said outer edge say about a quarter of the distance towards the sleeve 16 marking the central and top outlet from the tank. It will also be seen that due to the constant slow revolving motion of the movable chute 34, the incoming peas and accompanying matter will be deposited over a continuously new part of said zone of the water level of said tank, that is that the material instead of being dumped into the same portion of the tank as heretofore has been the practice, will now be spread out in a large long path, really a circular zone, so that there will be much more room for starting the initial separating process. This initial separating process starts at the instant the water, peas and other materials accompanying the good peas are deposited upon the top of the body of water in the tank. By distributing the incoming material over a large area the different articles

or particles in the mixture of material have at once a chance to float or sink separately upon or in the water and without later arriving water or material settling upon the top or adhering to the first material deposited. When a machine is arranged as herein described and illustrated with the use of two outlets from the movable chute, it will be obvious that the material deposited at any given moment from one outlet of said chute is free from later arriving water and material until the following chute outlet has traveled half the circumference of the tank. This length of time is sufficient for the good, that is the heavy peas, to sink far enough into the water so that they will not be disturbed by the next arriving layer of water and peas and other material. Furthermore, it will be seen that as the movable chute outlets are arranged in combination with the spiral collectors of light floating material a given portion of the surface of the distributing zone is cleared of light floating material as pea leaves, pea skins, pea pods and sticks, before another supply of peas and accompanying material is deposited at that point of the zone. This is accomplished in the first place by there being about an eighth of the circumference of the zone following the distributing outlet of the extension 37 before the near end of the succeeding spiral collector begins work upon that part of the zone. In this length of the zone or extent of travel of the parts the good heavy peas have an opportunity to sink below the level of the collector. Then the forward end of a collector, being the end of the collector next to the inner surface of the wall of the tank, comes into operation and as said spiral advances gradually collects or skims the floating poor peas and other poor or light material as pea skins, pea pods and leaves towards the center of the tank. By the time the next succeeding extension 37 of the movable chute comes over a given part of the distributing zone the preceding spiral has curved towards the center of the tank to a point inside of the inner side of the extension 37 so that no floating parts are left upon any given part of the distributing zone by the time that portion of the zone is reached by the second distributing outlet extension 37. It will be seen then that this second extension delivers a new supply of peas and waste matter and water and the process of the good peas gradually sinking and the poor material being gradually moved from the outer distributing zone towards the center is repeated. Continued rotation of the said spiral collectors shoves the light material continuously towards the central upper outlet and finally over the edge of the sleeve 16 with sufficient water to flow said light material through the pipe 15 and the slightly slanting pipe 13 to the second screen 14.

The movement of the collectors is slow enough to prevent starting any appreciable circular current. Furthermore, the sole movement of the collectors and the slight extent to which the collectors project below the top of the liquid in the tank 5 prevent the formation of any fast or forced pumping action by the collectors of the upper part of the water towards the central top outlet, but the movement of the collectors and their depth is sufficient co-operating with the presence of said central top outlet to give a slow movement of the upper part of the water towards said central outlet. This movement cooperates with the collecting or skimming movement of the collectors to move the light floating material towards said central outlet, but is not sufficiently strong or positive to carry therewith any of the good heavy peas.

Conveniently and preferably the machine will provide the means for rotating the two slanting screens 11 and 14 which receive respectively the good heavy peas and the poor light peas and other light material skimmed from the top of the tank. Convenient and the preferred form of having the machine so far described drive these screens consist in having the horizontal shaft 22 extend sufficiently beyond the bearing box 21 at the left side of the tank as seen in Fig. 1 to carry two spaced sprocket wheels 38 and 39. The sprocket wheel 38 is nearest to the bearing box 21 and has applied thereto a sprocket chain 40 which extends downwardly straddling the good pea outlet pipe 9 to engage sprocket wheels 41 and 42 on shafts 43 and 44 below and respectively to the left and right of the first cylindrical rotating screen 11. The said shafts 43 and 44 extend parallel with said cylindrical screen 11 and are each journaled in spaced bearings 45 the bearings towards the opposite ends of said screen being supported on suitable cross frame members 46. Outside the said bearings and below the projecting circular collars 47 at the right end and 48 at the left end of said screen there are mounted the flanged rollers 49 at the right end of the screen and 50 at the left end of the screen. These four spaced flanged rollers being of course keyed to the shafts 43 and 44 respectively which are in turn driven through the sprocket chain 40 impart the desired rotating movement to said screen. As the screen is mounted at a slight slant with its left end the lower, the good peas delivered into said screen are gradually moved to the exit or left end of the screen and thence pass through the open end into a suitable receptacle or receiving end 51 of a chute.

Substantially similar means are used to rotate the second screen 14 which receives the poor light peas and other light material skimmed from the top of the tank and flowed off with considerable water through the pipe 13. The sprocket wheel 39 seen farthest to

the left in Fig. 1 is engaged by a sprocket chain 52 which at its lower end straddles the outlet pipe 13 and engages two spaced sprocket wheels 53 and 54 to the left and right respectively and held below the said screen as seen in Fig. 5. These sprocket wheels are at the ends respectively of the spaced shafts 55 and 56. These shafts are each supported in two spaced bearings 45 supported from the transverse cross frame member 46 already mentioned so that the rollers 49 and 50 similar to those already described in regard to the other screen engage the annular projecting collars 47 and 48 on this screen. Beneath the lower or outlet end of this scren there may be placed a suitable receptacle or the receiving end 62 of a chute to handle and transport these waste materials.

What I claim as new and desire to secure by Letters Patent is:

1. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended path about said tank continuously and progressively in one direction, and means for so moving said chute.

2. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of an open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended path about said tank, the receiving part of said chute being relatively fixed in location, means for so moving said chute and a stationary feeding trough having its discharge end leading into the relatively-fixed receiving part of the distributing chute.

3. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of an open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended path about said tank, the receiving part of said chute being an open-topped hopper and relatively fixed in location, means for so moving said chute and a stationary feeding trough having its discharge end leading into the relatively-fixed receiving part of the distributing chute.

4. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly and progressively in an extended circular path about said tank and means for so moving said chute.

5. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of an open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended circular path about said tank, the receiving part of said chute being relatively fixed in location, means for so moving said chute and a stationary feeding trough having its discharge end leading into the relatively-fixed receiving part of the distributing chute.

6. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of an open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended circular path about said tank, the receiving part of said chute being an open-topped hopper and relatively fixed in location, means for so moving said chute and a stationary feeding trough having its discharge end leading into the relatively-fixed receiving part of the distributing chute.

7. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a circular open-topped separating tank, a centrally located outlet therefrom at the top for the discharge of floating material and an outlet near the bottom of the tank for the discharge of heavy material, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its upper and receiving part in the form of a hopper located centrally of said tank, with the body of said chute extending outwardly therefrom and with its discharge end movable slowly in an extended circular path about said tank, means for moving said discharge end of the chute, means for feeding the new material to said hopper part of said chute, a spirally shaped collector extending horizontally from the outer edge of said top outlet to the outer edge of said tank and extending a short distance into the liquid of the tank and means for slowly rotating said spiral collector so that floating material is drawn inwardly to said top outlet.

8. In a liquid and gravity operating device for separating and sorting fruits and vege-

tables, the combination of a circular open-topped separating tank, a centrally located outlet therefrom at the top for the discharge of floating material and an outlet near the bottom of the tank for the discharge of heavy material, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its upper and receiving part in the form of a hopper located centrally of said tank, with the body of said chute extending outwardly therefrom and with its discharge end movable slowly in an extended circular path about said tank, means for moving said discharge end of the chute, means for feeding the new material to said hopper part of said chute, a spirally shaped collector extending horizontally from the outer edge of said top outlet to the outer edge of said tank and extending a short distance into the liquid of the tank and means for slowly rotating said spiral collector at the same rate of rotation as said movable chute so that floating material is drawn inwardly to said top outlet.

9. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a circular open-topped separating tank, a centrally located outlet therefrom at the top for the discharge of floating material and an outlet near the bottom of the tank for the discharge of heavy material, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its upper and receiving part in the form of a hopper located centrally of said tank, with the body of said chute extending outwardly therefrom and with its discharge end movable slowly in an extended circular path about said tank, means for feeding the new material to said hopper part of said chute, a spirally shaped collector extending horizontally from the outer edge of said top outlet to the outer edge of said tank and extending a short distance into the liquid of the tank, a common means rotatable substantially on the vertical axis of said tank for rotatably supporting said distributing chute and said spiral collector and mechanism for so rotating said common support.

10. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a circular open-topped separating tank, a centrally located outlet therefrom at the top for the discharge of floating material and an outlet near the bottom of the tank for the discharge of heavy material, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its upper and receiving part in the form of a hopper located centrally of said tank, with the body of said chute extending outwardly therefrom and with its discharge end movable slowly in an extended circular path about said tank, means for feeding the new material to said hopper part of said chute, a spirally shaped collector extending horizontally from the outer edge of said top outlet to the outer edge of said tank and extending a short distance into the liquid of the tank, a vertical shaft substantially on the axis of said tank suspending and rotatably carrying said distributing chute and said spiral collector and means for rotating said shaft.

11. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended path about said tank continuously and progressively in one direction, means for so moving said chute and a floating-material collector movably mounted to follow said discharge end of the chute at a constant distance.

12. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly in an extended path about said tank continuously and progressively in one direction, means for so moving said chute, an outlet for floating material located centrally of said tank and close to the water level thereof and a floating-material collector slanting towards the center of the tank and movably mounted to follow said discharge end of the chute at a constant distance and move the floating material towards said central outlet.

13. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with its discharge end movable slowly and progressively in an extended circular path about said tank, means for so moving said chute and a floating-material collector movably mounted to follow said discharge end of the chute at a constant distance.

14. In a liquid and gravity operating device for separating and sorting fruits and vegetables, the combination of a fixed open-topped liquid-containing separating tank, a distributing chute for feeding the incoming material and liquid to said tank, said chute being movably mounted above said tank with

its discharge end movable slowly and progressively in an extended circular path about said tank, means for so moving said chute, an outlet for floating material located centrally of said tank and close to the water level thereof and a floating-material collector slanting towards the center of the tank and movably mounted to follow said discharge end of the chute at a constant distance and move the floating material towards said central outlet.

In witness whereof I have affixed my signature, this 13th day of January, 1931.

GEORGE J. OLNEY.